

## Global Research Trends on Chinese Medicine in Covid-19 Prevention and Treatment: A Bibliometric Analysis

Nikola Stojanov<sup>1</sup>, Filip Pavlovic<sup>1</sup>, Vukasin Milic<sup>1\*</sup>

<sup>1</sup>Department of Translational Health, Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia.

\*E-mail ✉ [vukasin.milic.th@gmail.com](mailto:vukasin.milic.th@gmail.com)

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### ABSTRACT

To undertake a quantitative analysis of the existing literature addressing the role of traditional Chinese medicine in managing COVID-19. Research articles concerning the prevention and treatment of COVID-19 using traditional Chinese medicine (TCM), published up to September 19, 2021, were collected from the Web of Science database. Data analysis was performed with the Bibliometrix R 4.0 software package to assess publication countries, research institutions, journals, citation metrics, and keywords. Additional analyses were carried out to examine the co-occurrence of keywords appearing in the titles and abstracts of the documents. Collaborative network analyses among authors, institutions, and publishing countries were also performed. Furthermore, statistical evaluations of classification categories were undertaken, and the development and current progress of key TCM studies were reviewed. Our final dataset comprised 417 research documents. A significant majority, 85.13%, originated from China. Regarding journal prestige, 148 documents (35.5%) were published in Quartile 1 journals, while 164 (39.3%) appeared in Quartile 2 journals; the majority of publications were concentrated within the Medicine category. Network analysis revealed strong cooperative ties among the involved institutions and countries. After excluding keywords related specifically to diseases or drugs, the four most prevalent keywords were 'Systematic review', 'Network pharmacology', 'Medicine', and 'Molecular docking'. Co-occurrence analysis of these keywords identified four principal association clusters. Statistical review of the TCM studies indicated that the Lianhua Qingwen capsule, Qingfei Paidu decoction, Shufeng Jiedu capsules, and ReDuNing injection were the most frequently investigated Chinese medicines. These four were utilized across clinical, bioinformatics, and basic research domains. In contrast, Toujie Quwen granule, Jinhua Qinggan granule, Shuanghuanglian oral liquid, Tanreqing injection, and Xuanfei Baidu decoction were subjects of clinical and bioinformatics investigation, but their underlying mechanisms lacked substantial basic research. The research landscape concerning the use of Chinese medicine for COVID-19 prevention and treatment has demonstrated a clear rise in both research intensity and collaborative engagement. While the studies generally cover a comprehensive range of types and focus on TCM formulations recommended by official Chinese COVID-19 guidelines, there remains a notable gap in detailed, in-depth investigation into their molecular mechanisms of action. Therefore, increased basic research is essential to accurately identify therapeutic mechanisms, which will subsequently allow for the standardization and validation of TCM applications in managing COVID-19.

**Keywords:** Traditional Chinese medicine, Coronavirus disease 2019, COVID-19, Bibliometrics, Prevention, Treatment

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### Introduction

Coronavirus Disease 2019 (COVID-19), caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), presents predominantly as a respiratory infection. Since its emergence in late December 2019, numerous mutant strains—including Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), Delta (B.1.167.2), Epsilon (B.1.429), and Iota (B.1.526)—have been documented globally [1, 2]. Current therapeutic strategies for SARS-CoV-2 infection primarily rely on vaccines and antiviral drugs, with the latter constituting the main treatment

modality in practice [3]. These antivirals generally fall into two categories: small-molecule drugs (e.g., protease and polymerase inhibitors) and SARS-CoV-2 neutralizing antibodies (such as bamlanivimab, etesevimab, casirivimab, and imdevimab) [4]. However, the increased transmissibility of newer viral lineages heightens the risk of immune escape, thereby restricting the applicability of these antiviral agents [2]. Specifically, studies indicate that bamlanivimab, etesevimab, casirivimab, and imdevimab are ineffective against Omicron mutants [5-7]. Furthermore, while small-molecule antivirals have shown efficacy in improving mild to moderate COVID-19 cases, evidence supporting their use in severe disease or against emerging variants remains insufficient [8]. Conversely, Traditional Chinese Medicine (TCM), administered via a “treatment based on syndrome differentiation” approach, has been reported to rapidly alleviate clinical symptoms in COVID-19 patients and exhibit efficacy against newer SARS-CoV-2 variants [9, 10]. Consequently, Chinese health authorities have jointly issued guidance advocating for an integrated medicine approach, highlighting the unique benefits of TCM in managing epidemic diseases [11]. Given that Chinese medicine comprises numerous chemical components capable of acting on multiple disease targets, substantial evidence supports its utility in COVID-19 treatment. To systematically classify and synthesize the scientific literature concerning the role of TCM in the prevention and treatment of COVID-19, we conducted a bibliometric analysis of relevant research indexed in the Web of Science database, covering the period from the outbreak until September 19, 2021.

## Materials and Methods

### *Search and data retrieval methods*

The literature search was executed on the Web of Science data platform (<http://webofscience.com>) using a combination of terms designed to capture both the intervention and the disease. The primary search terms included: ‘Traditional Chinese Medicine’, ‘Traditional Medicine, Chinese’, ‘Chinese Medicine, Traditional’, ‘Zhong Yiyao’, alongside disease-specific phrases such as ‘COVID 19’, ‘2019-nCoV Infections’, ‘COVID-19 Virus Infections’, ‘COVID-19 Virus Disease’, and ‘COVID 19 Virus Disease’. The scope was strictly limited to documents published in the English language from the inception of the database up to September 19, 2021. The search was performed across several key databases within the Web of Science environment: the Web of Science Core Collection, Science Citation Index Expanded, Social Sciences Citation Index, Current Chemical Reactions, and Index Chemicus.

The specific search logic employed was structured as follows:

#1 identified all records related to COVID-19 using various field terms.

#2 identified all records related to TCM using its various forms and transliterations.

#3 was generated by taking the intersection of documents retrieved from Query #1 and Query #2.

Following retrieval, the complete record and citation information for all relevant documents were exported in the Bib txt format for subsequent analysis.

### *Data analysis*

The retrieved bibliographies were processed and visualized using the Bibliometrix R software package (version 4.0) [12]. This package facilitated the derivation of national functional statistics to quantify publications originating from specific countries or regions, and the highest cited country function was employed to ascertain citation impact per country or region. Institutional output was quantified using the most relevant membership function. Keyword analysis utilized the word frequency function, with normalization configured to ‘association’ and the clustering algorithm set to Louvain, while ensuring that unconnected points were removed. Furthermore, co-occurrence network analysis was conducted to map keyword interdependence, and cooperative networks were modeled to delineate author and institutional collaborations. Finally, the outputs generated by the Bibliometric package were imported into Microsoft Excel software to structure the dataset into a standardized three-line table format.

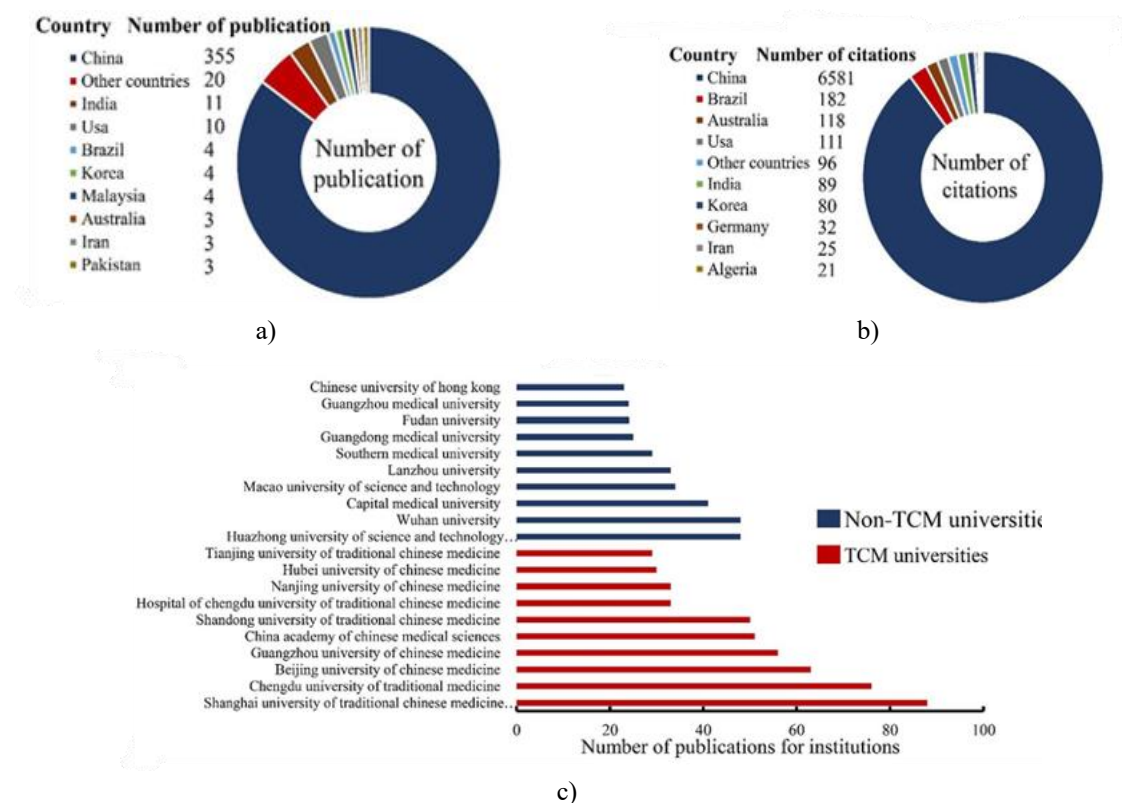
## Results and Discussion

### *Search results*

The initial search query retrieved a total of 652 documents. A systematic screening process, involving the review of titles and abstracts, was subsequently applied for exclusion. Specifically, 18 documents deemed irrelevant to both TCM and COVID-19, 13 documents focusing on TCM but excluding COVID-19, and 204 documents pertaining to COVID-19 without a TCM focus were removed. This rigorous filtration resulted in a final corpus of 417 documents. These selected articles were published across the period spanning 2020 to September 19, 2021, comprising 212 publications from 2020 and 205 from 2021. Collectively, this set of 417 documents has accrued 7,335 citations. The final cohort involved 1,819 author names, contributions from a total of 132 journals, and affiliations with 683 institutions across 46 countries and regions.

### *Institutional analysis*

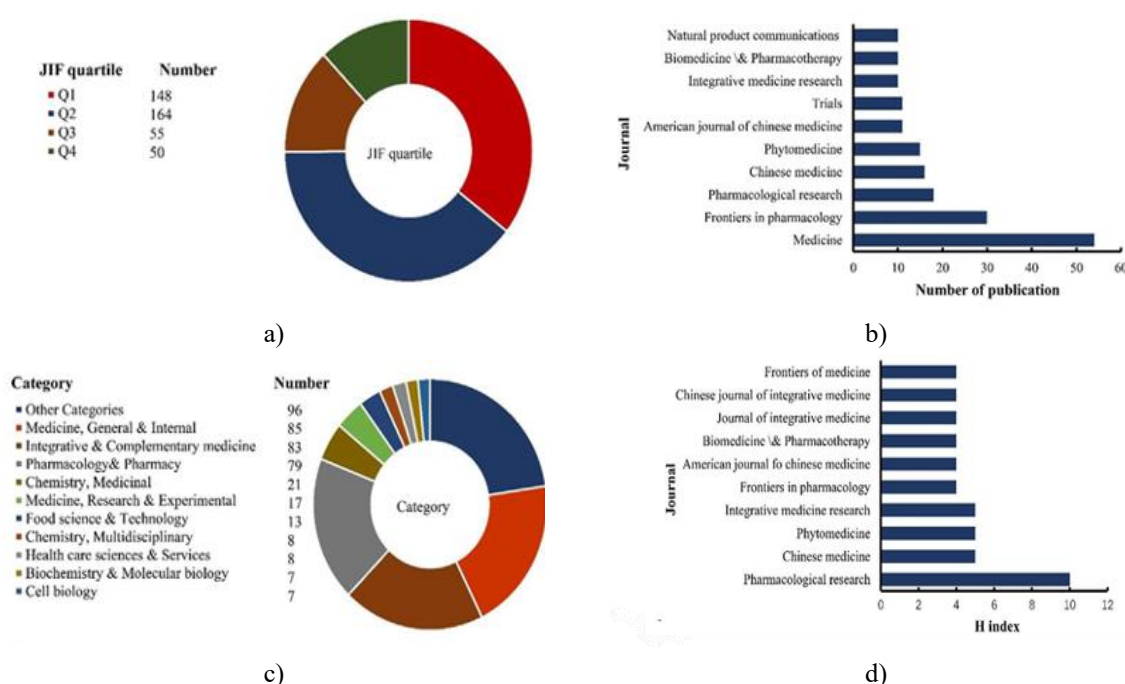
The geographical distribution of the contributing research was analyzed, revealing that the majority of the published documents originated from authors affiliated with China, India, and the USA (**Figure 1a**). China demonstrated the most significant productivity in TCM research for COVID-19 prevention and treatment, accounting for 355 of the 417 documents (85.13%). When examining citation impact (**Figure 1b**), the most cited studies were found to be those conducted in China, Brazil, and Australia. Specifically, articles published by Chinese authors garnered 6,581 citations, representing 89.72% of the total citations, thereby confirming China's predominant role in this research domain. The 683 institutions represented within the 417-document set were ranked based on publication output (**Figure 1c**). Ten of the top twenty leading institutions were TCM universities. The top three institutions by publication count were the Shanghai University of Traditional Chinese Medicine (n=88, 21.10%), the Chengdu University of Traditional Chinese Medicine (n=76, 18.23%), and the Beijing University of Traditional Chinese Medicine (n=63, 15.11%). Among non-TCM institutions, the leading contributors included Huazhong University of Science and Technology (n=48, 11.51%), Wuhan University (n=48, 11.51%), and Capital Medical University (n=41, 9.83%). The fact that all top twenty institutions were situated within China underscores the high level of research activity concentrated in Chinese universities within this specific field.



**Figure 1.** Countries with the highest number of publications (a), number of citations (b) and number of publications for institutions (c).

### Journal analysis

The 132 journals housing the 417 selected documents were categorized according to their impact factors into quartiles (Q1 to Q4). The majority of publications appeared in higher-quartile venues, with 148 documents published in Q1 journals and 164 in Q2 journals (**Figure 2a**). Among the journals utilized, the highest volume of reports originated from *Medicine (Baltimore)* ( $n=54$ ), *Frontiers in Pharmacology* ( $n=30$ ), and *Pharmacological Research* ( $n=18$ ), all noted for their previous publication record in TCM research (**Figure 2b**). The overall impact factor distribution for the selected journals was relatively modest; only eight journals possessed an impact factor greater than 10, encompassing just 11 documents (2.64% of the total). Conversely, 37 journals had an impact factor greater than 5, in which 120 documents (28.87%) were published. The journal exhibiting the highest impact factor ( $IF=18$ ) was *Signal Transduction and Targeted Therapy*. The thematic categorization of the documents indicated that the largest portions were published in journals categorized as Medicine, General & Internal ( $n=85$ ), Integrative & Complementary Medicine ( $n=83$ ), and Pharmacology & Pharmacy ( $n=79$ ) (**Figure 2c**). To assess journal recognition, the top twenty journals ranked by their h-index (defined as the number of articles published in a journal that have achieved at least h citations) were identified. These twenty journals accounted for 237 documents (56.83% of the corpus). *Pharmacological Research* achieved the highest h-index ranking, signifying its substantial recognition within the field of TCM literature (**Figure 2d**). Between 2020 and 2021, this journal published 18 articles related to TCM treatment of COVID-19, which accumulated 802 citations in total. The most cited of these was the study by Li *et al.* [13], which demonstrated that Lianhua Qingwen significantly inhibited SARS-CoV-2 replication, altered virus morphology, and exhibited both antiviral and anti-inflammatory activities *in vitro*.



**Figure 2.** The impact factor of journals (journal impact factor; JIF) publishing the 417 documents categorized as quartiles 1 to 4 (a), the number of publications per journal (b), per journal category (c) and the author H index of documents published per journal (d).

### Cooperation network

An examination of the 417 documents revealed that research activity tends to cluster into several distinct collaboration networks (**Figure 3a**). One group is made up of major comprehensive universities that regularly work together, another is organized around institutions specializing in traditional Chinese medicine, and others consist of smaller, discipline-specific alliances. These networks include partnerships among universities in Wuhan and Beijing, strong links between several Shanghai-based institutions, cooperation among research centers in



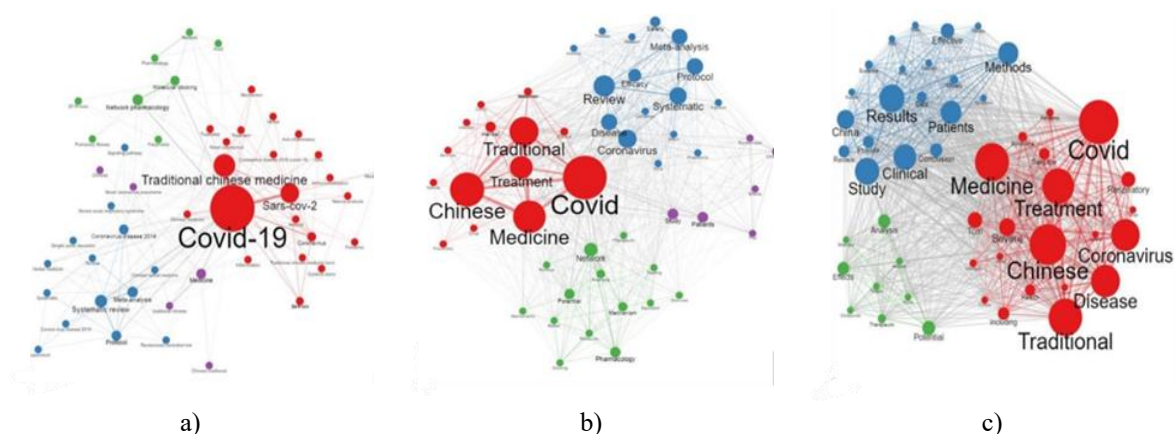


### Keyword analysis

Keywords reflect the primary research themes of an article. From the 417 documents included in this study, a total of 939 keywords were identified. The most frequently appearing terms were Covid-19 (242 occurrences), Traditional Chinese Medicine (97 occurrences), and SARS-CoV-2 (75 occurrences). When excluding disease- and drug-related terms, the most common keywords were Systematic Review (43 occurrences), Network Pharmacology (42 occurrences), Medicine (35 occurrences), and Molecular Docking (35 occurrences) (**Figure 4**). These findings suggest that the analyzed studies primarily concentrated on clinical and pharmacological investigations as well as evaluations of information systems.

### Co-occurrence network

Analysis of co-occurring terms across keywords, titles, and abstracts revealed distinct patterns in the research focus. Keywords most often appeared in clusters linking Covid-19 with Traditional Chinese Medicine and SARS-CoV-2, while other clusters highlighted severe respiratory syndromes, systematic reviews, network pharmacology, molecular docking, and related pulmonary conditions. Examination of article titles mirrored these themes, showing strong associations between Covid-19 and Chinese medicine, research on pharmacological mechanisms, clinical trials involving patients, and meta-analytical studies. Abstract-level analysis further emphasized the integration of treatment strategies for Covid-19, clinical study designs and methodologies, and evaluations of potential therapeutic effects. Together, these patterns indicate that the literature concentrates on combining disease-specific investigations with clinical, pharmacological, and methodological research approaches.



**Figure 5.** Co-occurrence of key words in the 417 documents as a whole (a), the documents titles (b) and their Abstracts (c).

### Analysis of literature focusing on TCM treatment for COVID-19

From the 417 initially selected articles, we focused specifically on studies investigating the therapeutic effects of Traditional Chinese Medicine (TCM) for COVID-19. In this process, 189 review articles, 6 cross-sectional studies addressing public perceptions of TCM and COVID-19 diagnostic features, and 22 studies employing data mining approaches such as association rules, deep learning, or predictive model construction were excluded. The remaining 200 publications comprised 39 clinical studies, 5 clinical study protocols, 29 experimental studies, 53 network pharmacology analyses, 9 molecular docking studies, 23 systematic reviews, and 42 systematic review protocols. Across these studies, a total of 93 different TCM treatments were reported. The most frequently used treatments included Lianhua Qingwen capsule (16 studies), Qingfei Paidu decoction (9), Shufeng Jiedu capsule (8), Reduning injection (4), Toujie Quwen granule (3), Shenhuang granule (3), and Jinhua Qinggan granule (3). Less commonly used therapies included Xiyanping injection (2), Xuanfei Baidu decoction (2), and Shuanghuanglian oral liquid (2) (**Table 1**). Notably, seven of the ten most frequently reported TCM interventions—Lianhua Qingwen capsule, Qingfei Paidu decoction, Shufeng Jiedu capsule, Reduning injection, Jinhua Qinggan granule, Xiyanping injection, and Xuanfei Baidu decoction—are included in China's official guidelines for the prevention and treatment of COVID-19 [14].

**Table 1.** Study designs and Chinese medicine treatment used in the included research

| Study Type                    | Number of Publications (%) | Key TCM Treatments Reported   |
|-------------------------------|----------------------------|---|
| Network Pharmacology          | 53 (12.7%)                 | Shufeng Jiedu capsules (4), Qingfei Paidu decoction (3), Lianhua Qingwen capsule (3), Xuebijing injection (3), Maxing Shigan decoction (2), Huashi Baidu formula (2), Zukamu granules (2), Fufang Banlangen (2), Others (single mentions)                               |
| Protocol of Systematic Review | 42 (10.1%)                 | General TCM (13), Acupuncture (5), Lianhua Qingwen capsule (3), Qingfei Paidu decoction (2), External TCM therapies (2), Xuebijing injection, Huashi Baidu formula, Shufeng Jiedu capsules, Reyanning Mixture, Fire needle, Baduanjin, Qigong, Others (single mentions) |
| Clinical Study                | 39 (9.4%)                  | TCM formulas (12), Shenhua granule (2), Reduning injection (2), Shufeng Jiedu capsules (1), Qingfei Paidu decoction (1), Jinhua Qinggan granules (1), Traditional Chinese and Western medicine management (1), Others (single mentions)                                 |
| Experimental Study            | 29 (6.9%)                  | Qingfei Paidu decoction (3), Lianhua Qingwen capsule (3), Maxing Shigan decoction (2), Rhamnocitrin (2), Shufeng Jiedu capsules (1), Andrographolide (1), Liu Shen capsule (1), Reynoutria rhizomes (1), Other herbal combinations (single mentions)                    |
| Systematic Review             | 23 (5.5%)                  | General TCM (16), Lianhua Qingwen capsule (6), Acupuncture (1)  |
| Molecular Docking             | 9 (2.2%)                   | Liquorice (2), Theaflavin (1), Andrographis paniculata phytochemicals (1), Saikosaponins (1), Shuanghuanglian preparations (1), Respiratory Detox Shot (1), Jinhua Qinggan granules (1), Shufeng Jiedu capsules (1), Others (single mentions)                           |
| Protocol of Clinical Study    | 5 (1.2%)                   | Acupressure therapy + Liu Zi Jue (1), Auricular point pressure (1), Shenhua granule (1), Liu Zi Jue (1), Baidu Jieduan granules (1)   |

*Research status of core Chinese medicine*

We examined the ten Chinese herbal treatments most frequently reported in the selected studies using the CNKI and Web of Science databases. Findings indicate that Lianhua Qingwen capsules, Qingfei Paidu decoction, Reduning injection, and Shufeng Jiedu capsules have been explored in a variety of settings, including clinical applications, computational analyses, and laboratory-based experiments. By comparison, Toujie Quwen granule, Jinhua Qinggan granule, Shuanghuanglian oral liquid, Tanreqing injection, and Xuanfei Baidu decoction have primarily been evaluated in patient-focused studies and bioinformatics research, with relatively little work investigating their underlying biological mechanisms. **Table 2** provides a summary of the contexts in which these TCM interventions have been studied.

**Table 2.** Research status of core Chinese medicine.

| Treatment                              | Key Herbal Components   | Clinical Findings   | Bioinformatics/Network Analysis   | Mechanistic/Basic Research   |
|--|---|---|---|--|
| <b>Lianhua Qingwen capsules (LHQW)</b> | Lianqiao, Jinyinhua, Mahuang, Kuxingren, Shigao, Banlangen, Mianmaguanzhong, Yuxingcao, Huoxiang, Dahuang, Hongjingtian, Bohena, Gancan | Improved cure rates; faster symptom resolution; reduced fever, fatigue, and cough; better chest CT outcomes | Linked to multiple viral infections including Hepatitis B, HIV-1, Influenza A, EBV, and viral myocarditis | Inhibits ACE2 via rhein and forsythosides; deactivates NF- $\kappa$ B; reverses SOCS3 in macrophages; reduces SARS-CoV-2 replication and inflammation in vitro |
| <b>Qingfei Paidu decoction (QFPDD)</b> | Mahuang, Gancan, Xingren, Shigao, Guizhi, Zexie, Zhuling, Baizhu, Fuling, Chaihu, Huangqin, Banxia, Shengjiang, Ziyuan,                 | Antipyretic and anti-inflammatory; reduces organ damage; lowers risk of in-hospital death; improves         | TNF, NOD-like receptor, Toll-like receptor, MAPK, HIF-1 signaling pathways                                | Regulates USP14 to promote ATF2 degradation; alleviates spleen inflammation; inhibits coronavirus replication; modulates                                       |

|   |  |   |  |   |
|---|--|---|--|---|
|   | Donghua, Shegan, Xixin, Shanyao, Zhishi, Chenpi, Huoxiang  | symptoms, inflammation, lung lesion absorption, tongue appearance, nucleic acid negativity, and hospitalization time                |  | gut microbiota composition  |
| <b>Reduning injection</b>                     | Qinghao, Jinyinhua, Zhizi  | Increases symptom remission rate; shortens symptom duration, nucleic acid negativity, hospitalization, and fever                    | Oxidative stress, MAPK, chemokine, and inflammatory storm-related pathways   | Reduces serum CRP and IL-5; lowers lung index and pathological lung damage; decreases viral load and inflammatory cytokines (IL-6, TNF- $\alpha$ ) in mice                  |
| <b>Shufeng Jiedu capsules</b>                 | Huzhang, Lianqiao, Banlangen, Chaihu, Baijiangcao, Mabiancao, Lugen, Gancao                                  | Antipyretic; improves pneumonia symptoms; reduces serum IL-6, IL-21, TNF- $\alpha$ , HMGB1; improves WBC, lymphocyte, ESR, LDH, CRP | Human cytomegalovirus, Kaposi's sarcoma-associated herpesvirus, IL-17, TNF, Th17 differentiation, HIF-1 signaling  | Reduces lung pathology; improves lung function (PIF, MV, PEF); boosts CD3+, CD4+, CD4+/CD8+ ratios; enhances SOD, GSH-Px activity; lowers CD8+, TNF- $\alpha$ , hs-CRP, MDA |
| <b>Toujie Quwen granules ("Fei Yan No.1")</b> | Chaihu, Huangqin, Banxia, Dangshen, Gualou, Binglang, Caoguo, Houpo, Zhimu, Shaoyao, Gancao, Chenpi, Huzhang | Increases SARS-CoV-2 nucleic acid negativity; improves clinical efficacy; reduces TCM syndrome score, CRP, PCT, D-dimer             | Neuroactive ligand-receptor interaction, apoptosis, renin-angiotensin, calcium signaling, arachidonic acid metabolism, vascular smooth muscle contraction, NF- $\kappa$ B, platelet activation, others | Not yet studied   |
| <b>Jinhua Qinggan granules</b>                | Jinyinhua, Zhebeimu, Huangqin, Niubangzi, Qinghao  | Shortens nucleic acid negativity time; promotes absorption of pneumonia exudates; symptom relief without adverse reactions          | TNF, influenza A, HIF-1, NOD-like receptor, Toll-like receptor, VEGF, MAPK, T-cell receptor pathways   | Not yet studied   |
| <b>Shuanghuanglian oral liquid</b>            | Jinyinhua, Huangqin, Lianqiao  | Increases SARS-CoV-2 nucleic acid negative conversion; promotes absorption of pneumonia lesions                                     | Hepatitis B, TNF, pulmonary tuberculosis, pertussis, Salmonella infection, influenza A, herpes simplex virus pathways  | Not yet studied   |
| <b>Tanreqing capsule</b>                      | Huangqin, Xiongdanfen,   | Shortens time to fecal and pharyngeal-fecal   | IL-17, T-cell receptor, arachidonic acid metabolism, cAMP,   | Not yet studied   |



|                                    |  |   |   |                 |
|------------------------------------|--|---|---|-----------------|
|                                    | Shanyangjiao,<br>Jinyinhua, Lianqiao   | nucleic acid<br>negativity  | PI3K-Akt, influenza A<br>pathways   |                 |
| <b>Xiyanping<br/>injection</b>     | Chuanxinlian   | Reduces cough,<br>fever, virus<br>clearance time;<br>prevents<br>progression to<br>severe disease | KSHV, CMV, AGE-<br>RAGE, Hepatitis B/C,<br>pancreatic cancer,<br>COVID-19, C-type lectin<br>receptor, influenza A,<br>VEGF, TNF, EBV,<br>osteoclast differentiation,<br>FoxO, cellular<br>senescence, PD-L1/PD-1,<br>IL-17, endocrine<br>resistance, Chagas disease<br>pathways | Not yet studied |
| <b>Xuanfei Baidu<br/>decoction</b> | Mahuang, Xingren,<br>Shigao, Cangzhu,<br>Yiyiren, Huoxiang,<br>Huzhang, Tinglizi,<br>Mabiancao, Lugen,<br>Qinghao, Juhong,<br>Gancao | Improves clinical<br>symptoms;<br>increases WBC<br>and lymphocytes;<br>reduces CRP and<br>ESR     | KSHV, Chagas disease,<br>tuberculosis, hepatitis B,<br>TNF, IL-17, pertussis,<br>influenza A,<br>toxoplasmosis, malaria,<br>Salmonella, leishmaniasis<br>pathways   | Not yet studied |

Traditional Chinese Medicine (TCM) has demonstrated unique strengths in the prevention and management of COVID-19, effectively alleviating symptoms, enhancing immunity, and helping to control the spread of the disease [15, 16]. In the present study, a bibliometric approach was employed to assess the most influential research on TCM in the context of COVID-19 prevention and treatment.

The earliest study reporting the use of TCM against SARS-CoV-2 was published in January 2020. Of the 417 publications analyzed, 212 appeared in 2020, while 205 were published in 2021. Given that three months remained in 2021 at the time of writing, it is likely that the number of publications for that year will surpass those of 2020, indicating an accelerating pace of research in this area. Following reports highlighting the therapeutic benefits of TCM for COVID-19, interest in TCM principles and interventions has expanded internationally, with researchers from countries including Singapore, India, the United States, and Brazil investigating its anti-SARS-CoV-2 effects. Malaysia has also issued official guidelines on the application of TCM for COVID-19 prevention and treatment [17].

According to the Journal Citation Reports (JCR), journals are categorized by discipline and ranked into four quartiles based on impact factor, with Q1 and Q2 representing higher citation influence. Our analysis revealed that nearly three-quarters (74.8%) of studies on TCM for COVID-19 were published in Q1 or Q2 journals—a proportion notably higher than previous reports by Li *et al.* [18]—indicating that research in this field is increasingly standardized and provides a credible reference for clinical guidance. Nevertheless, only 11 publications appeared in journals with an impact factor greater than 10, suggesting that further efforts are needed to enhance the quality and visibility of research on TCM for COVID-19.

Most of the research institutions contributing to this field are Chinese Medicine universities and comprehensive universities in China. Our analysis revealed that these institutions rarely conducted studies in isolation; rather, there was substantial collaboration among researchers and institutions, spanning different disciplines and geographic regions. For example, Beijing University of Chinese Medicine and China Academy of Chinese Medical Sciences share research focus areas and are geographically proximate, while Shanghai Jiaotong University collaborates with Shanghai University of Chinese Medicine, and Guangzhou University of Chinese Medicine partners with Sun Yat-sen University. Similarly, universities with shared disciplinary focus, such as Shanghai University of Chinese Medicine and Hubei University of Chinese Medicine, also exhibited strong cooperation. International collaborations have also increased, particularly between China and the United States, likely facilitated by the significant presence of Chinese researchers and students in American institutions [19].

Analysis of keyword frequencies in the included literature revealed that studies on the anti-SARS-CoV-2 effects of Traditional Chinese Medicine (TCM) primarily focus on clinical research, systematic evaluations, network pharmacology, and molecular docking. Co-occurrence analysis of keywords indicated distinct associations with each research type: clinical studies commonly feature terms such as COVID-19, Traditional Chinese Medicine,

and SARS-CoV-2; basic research often involves terms like severe acute respiratory syndrome, signaling pathways, and coronavirus disease 2019; network pharmacology frequently appears alongside molecular docking and pulmonary fibrosis; while randomized controlled trials and meta-analyses are linked to systematic reviews. Categorizing the 417 documents by study type revealed 41 clinical studies, 29 experimental studies, 53 network pharmacology studies, 9 molecular docking studies, and 23 systematic reviews, demonstrating that research on TCM and SARS-CoV-2 is multidimensional.

## Conclusion

This study reviewed the published literature on the use of Traditional Chinese Medicine (TCM) for the prevention and treatment of COVID-19, examining aspects such as publication year, journal, country, institution, title, abstract, and keywords. The analysis identified the core TCM therapies tested for COVID-19 prevention and treatment, which largely align with the formulations recommended in Chinese national guidelines. Our findings also indicate that both research activity and recognition, as well as collaboration within this field, have increased throughout the course of the pandemic. While the studies analyzed generally encompass a comprehensive range of research types, the most frequently used TCM formulations are consistent with guideline recommendations. However, there remains a notable lack of in-depth research investigating the molecular mechanisms underlying these therapies, highlighting the need for further basic studies to elucidate therapeutic pathways and optimize clinical use.

This study has several limitations. First, only publications indexed in the Web of Science were included, meaning relevant studies in other databases such as CNKI, WANFANG, WEIPU, and PubMed may have been overlooked. Second, although we quantified the number of studies reporting TCM usage, we did not analyze the actual conditions or patterns of their clinical application. Third, detailed aspects such as TCM diagnosis of COVID-19, principles and timing of drug administration, comparative efficacy of different formulations, and the quality of evidence were not examined. As a result, the clinical guidance provided by this review is somewhat limited.

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**Conflict of Interest:** None

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**Ethics Statement:** None

## References

1. World Health Organization. Tracking SARS-CoV-2 variants [EB/OL]. (2022-06-01) [2022-06-08]. <https://www.who.int/zh/activities/tracking-SARS-CoV-2-variants>.
2. W. Gu, S.H. Yu, Research progress of novel coronavirus variation spectrum [J], *Linchuang Feike Zazhi* 27 (6) (2022) 932–935 [Chinese with abstract in English].
3. X. Zhen, C.Y. Zhang, S.C. Chen, G.Y. Jiao, L.Y. Hao, Advances in research on novel coronavirus drugs[J], *Shiyong Yaowu Yu Linchuang* 24 (2) (2021) 97–103 [Chinese with abstract in English].
4. Y. Wang, J.H. Yan, R. Shi, Clinical research progress of anti-new coronavirus neutralizing antibody drugs[J], *Sheng Wu Gong Cheng Xue Bao* 38 (6) (2022) 2061–2068 [Chinese with abstract in English].
5. K. Westendorf, S. Z'entelis, L. Wang, D. Foster, P. Vaillancourt, M. Wiggin, et al., LY-CoV1404 (bebtelovimab) potently neutralizes SARS-CoV-2 variants, *Cell Rep.* 39 (7) (2022 May 17), 110812.
6. Y. Cao, J. Wang, F. Jian, T. Xiao, W. Song, A. Yisimayi, et al., Omicron escapes the majority of existing SARS-CoV-2 neutralizing antibodies, *Nature* 602 (7898) (2022 Feb) 657–663.
7. L. Liu, S. Iketani, Y. Guo, J.F. Chan, M. Wang, L. Liu, et al., Striking antibody evasion manifested by the Omicron variant of SARS-CoV-2, *Nature* 602 (7898) (2022 Feb) 676–681.
8. Z. Zhao, Q. Zhang, Z.R. Ge, W. Zhang, Z.H. Chen, The breakthrough progress of small molecule anti-coronavirus drugs [J], *Zhongguo Yaowu Jingjie* 19 (1) (2022) 1–6 [Chinese with abstract in English].
9. L. Chen, F. Liu, J.H. Wu, H.Y. Song, J.S. Xia, B. Sheng, etc. Retrospective analysis of the clinical efficacy

- of Shufeng Jiedu capsule combined with western medicine in the treatment of patients with common coronavirus pneumonia, *Zhongguo Shiyang Fangjixue Zazhi* 26 (16) (2020) 14–20 [Chinese with abstract in English].
10. B.J. Fang, H. Su, R.J. Zhao, S.B. Wang, W.S. Qi, L. Kong, et al., Expert consensus on the prevention and treatment of traditional Chinese medicine infection with novel coronavirus Omicron variant [J], *Zhongguo Jijiu Yixue* 42 (4) (2022) 277–280 [Chinese with abstract in English].
11. State administration of traditional Chinese medicine. Actively playing the role of traditional Chinese medicine in the prevention and treatment of new coronary pneumonia. [2020–05–13]. <http://www.satcm.gov.cn/xinxifabu/meitibaodao/2020-05-13/15078.html>.
12. M. Aria, C. Cuccurullo, Bibliometrix: an R-tool for comprehensive science mapping analysis, *Journal of Informetrics* 11 (4) (2018) 959–975. <https://www.sciencedirect.com/science/article/abs/pii/S1751157717300500>.
13. R.F. Li, Y.L. Hou, J.C. Huang, W.Q. Pan, Q.H. Ma, Y.X. Shi, et al., Lianhuaqingwen exerts anti-viral and anti-inflammatory activity against novel coronavirus (SARS-CoV-2), *Pharmacol. Res.* 156 (2020), 104761 [PubMed], <https://pubmed.ncbi.nlm.nih.gov/32205232>.
14. Y.L. Li, Z.J. Tan, Z.Y. Yuan, Research progress on prevention and treatment of new coronavirus pneumonia, *Shizhen Guoyi Guoyao* 32 (5) (2021) 1251–1253 [Chinese with abstract in English].
15. H. Liu, Y.X. Ma, B.B. Feng, B. Tan, The research progress of traditional Chinese medicine in the prevention and treatment of new coronavirus pneumonia, *Zhongguo Heli Yongyao Tansuo* 18 (8) (2021) 10–12 [Chinese with abstract in English].
16. Y.N. Sun, W.L. Lu, H. Li, Y. Xiao, W. Yang, H.J. Yang, et al., A multicenter clinical study of Qingfei Paidu Decoction in the treatment of 295 cases of mild/common new coronavirus pneumonia, *Zhongyi Zazhi* 62 (7) (2021) 599–603 [Chinese with abstract in English].
17. J.Q. Zheng, B.M. Chen, J.X. Zhang, Malaysian new coronavirus pneumonia TCM program (trial version 3), *Beijing Zhongyiyao Daxue Xuebao* 44 (9) (2021) 784–788 [Chinese with abstract in English].
18. M.L. Li, S.C. Gao, L. Ma, Q. Wang, R.Q. Zhao, Bibliometrics study on SCI papers output in 24 Chinese medicine universities from 2007 to 2016, *Yixue Yu Shehui* 33 (1) (2020) 65–69 [Chinese with abstract in English].
19. Y. Wang, The Number of Chinese Students Studying in the United States Is 55,000 Less. *Huanqiu Shibao*, 2021, pp. 11–16 (003) [Chinese with abstract in English].